



Original Article

Characteristics, comorbidities, and complications in multiple sclerosis (MS) and non-MS patients undergoing lumbar fusion for deformity

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ABSTRACT

Background: We compared the characteristics, comorbidities, and complications in spinal deformity patients with and without multiple sclerosis (MS) undergoing primary lumbar spine fusion.

Methods: We used the Nationwide Inpatient Sample (NIS) from 2003 to 2014, International Classification of Diseases, Ninth Revision, Clinical Modification diagnosis and procedure codes to create experimental MS (842 patients) and non-MS control (165,726 patients) cohorts undergoing primary lumbar spine fusion. Characteristics, comorbidities, and complications in spinal deformity patients with and without MS were evaluated using univariate and bivariate analysis.

Results: MS spinal deformity patients undergoing primary lumbar spine fusion were younger, more likely to be female and more likely to undergo surgery at urban teaching hospitals. They also exhibited higher rates of depression and lower rates of diabetes without chronic complications, hypertension, and renal failure. However, no significant differences were found in mortality or total perioperative complication rates between MS and non-MS patients.

Conclusion: We found that MS versus non-MS patients undergoing primary lumbar fusion for spinal deformity were younger, more likely to be female and had higher rates of depression but lower rates of diabetes, hypertension, and renal failure. Notably, both groups experienced comparable mortality and perioperative complication rates.

Keywords: Lumbar spine fusion, Multiple sclerosis, Nationwide outcomes, Patient characteristics, Spinal deformity, Surgical complications

INTRODUCTION

Multiple sclerosis (MS) is an autoimmune inflammatory disorder of the central nervous system that is characterized by demyelination and axonal loss. It is the second most common cause of disability in the United States (US), affecting about 400,000 people.^[1,3] MS patients may develop lumbar spine pathology such as ankylosing spondylitis, lumbar back pain (10–16% prevalence), and spondylosis leading to spinal deformity and potentially requiring surgical intervention.^[2,7] Here, we performed

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a nationwide analysis of the impact of MS on lumbar spine fusion that included: (1) characteristics of patients with and without MS undergoing lumbar spine fusion, (2) the rates of comorbidities in patients with MS undergoing lumbar spine fusion versus those without MS, and (3) the rate of complications for these MS versus non-MS patients.

MATERIALS AND METHODS

Surgical procedure data source

We utilized the Nationwide Inpatient Sample (NIS) database, the largest all-payer database of inpatient admissions in the United States. It contains an approximately 20% stratified sample of discharges from US hospitals, representing around 96% of the population. A total of 34,502 (166,568 weighted) patients meeting the inclusion and exclusion criteria were

identified, with 842 weighted in the experimental group with MS and 165,726 weighted in the control group without MS. NIS data are publicly available and de-identified; therefore, the study was exempt from institutional review board approval.

Surgical inclusion and exclusion criteria

Patients ≥ 18 -years-old were included in the study. From 2003 to 2014, the nationwide inpatient sample (NIS) database was queried for multiple International Classification of Diseases, Ninth Revision, Clinical Modification diagnosis codes for patients undergoing lumbar spine fusion (81.06–81.08); those having revisions (81.30–81.39) were excluded from the study. All patients with MS were included in the experimental group and removed from the non-MS control group for the statistical analysis.

Table 1: Comparison of patient characteristics for MS versus non-MS patients undergoing primary lumbar spine fusion.

	MS, n=842	Control, n=165,726	P-value
Age, y (SD) (range)	60 (9.83) (22–79)	64 (12.55) (18–95)	$P < 0.001^*$
Sex (%)			
Female	82.44	67.71	$P < 0.001^*$
Male	17.56	32.29	
Length of stay, d (SD) (range)	5.57 (4.27) (0–44)	4.99 (3.99) (0–124)	$P = 0.080$
Primary payer (%)			
Medicare	62.77	54.48	$P = 0.218$
Medicaid	1.73	2.82	
Private insurance	34.36	37.73	
Self-pay, no charge, or other	1.14	4.98	
Race (%)			$P = 0.664$
White	93.51	89.47	
Black or African American	3.57	3.54	
Hispanic	1.46	3.50	
Asian or Pacific Islander	0	0.95	
Native American or other	1.46	2.54	
Hospital bed size (%)			$P = 0.273$
Small	10.09	14.72	
Medium	24.91	22.72	
Large	65.00	62.56	
Location and teaching status (%)			$P = 0.038^*$
Rural	1.13	4.28	
Urban non-teaching	35.96	40.90	
Urban teaching	62.92	54.82	
Admission day (weekend) (%)			$P = 0.350$
Yes	99.48	1.13	
No	0.52	98.87	
Hospital region (%)			$P = 0.443$
North-east	10.70	12.93	
Midwest	29.20	23.63	
South	38.20	39.69	
West	21.89	23.75	
Total charges, \$ (SD) (range)	154,461 (113,765) (28,948–818,670)	147,044 (121,440) (132–2,445,411)	$P = 0.417$

*Statistically different patient characteristics. MS: Multiple sclerosis, SD: Standard deviation, n: Number, y: Years, d: Days

Statistical analysis

National estimates were created for each variable by applying stratified sampling weights. Univariate analysis was conducted to determine patient characteristics as described in Table 1. Patient comorbidities [Table 2] and complications [Table 3]

Table 2: Comparison of patient comorbidities and mortality for MS versus non-MS patients undergoing primary lumbar spine fusion.

	MS, n=842	Control, n=165,726	P-value
Alcohol abuse (%)			P=0.172
Yes	0	1.40	
No	100	98.60	
Iron deficiency anemia (%)			P=0.463
Yes	14.09	12.21	
No	85.91	87.79	
Chronic blood loss anemia (%)			P=0.503
Yes	2.08	1.49	
No	97.92	98.51	
Congestive heart failure (%)			P=0.738
Yes	2.94	2.53	
No	97.06	97.47	
Chronic pulmonary disease (%)			P=0.865
Yes	16.16	16.66	
No	83.84	83.34	
Depression (%)			P=0.003*
Yes	24.60	16.17	
No	75.40	83.83	
Diabetes without chronic complications (%)			P=0.027*
Yes	7.99	13.49	
No	92.01	86.51	
Diabetes with chronic complications (%)			P=0.836
Yes	1.83	1.62	
No	98.17	98.38	
Drug abuse (%)			P=0.227
Yes	2.39	1.32	
No	97.61	98.68	
Hypertension (%)			P=0.028*
Yes	49.62	57.54	
No	50.38	42.46	
Liver disease (%)			P=0.638
Yes	0.59	0.94	
No	99.41	99.06	
Fluid and electrolyte disorders (%)			P=0.966
Yes	15.51	15.63	
No	84.49	84.37	
Obesity (%)			P=0.319
Yes	9.17	11.49	
No	90.83	88.51	
Renal failure (%)			P=0.033*
Yes	0.52	3.26	
No	99.48	96.74	
Died during hospitalization (%)			P=0.599
Yes	0	0.19	
No	100	99.81	

*Statistically different rates of comorbidities. MS: Multiple sclerosis, n: number

were also determined. χ^2 test was used to compare categorical variables between the experimental and control groups, whereas *t*-test was used to compare continuous variables.

RESULTS

We found that MS patients undergoing lumbar spine fusion were younger, more likely to be female and more likely to have surgery at urban teaching hospitals, had higher rates of depression and lower rates of diabetes without chronic complications, hypertension, and renal failure. There were no significant differences between the MS patients and non-MS control group for other comorbidities including complications and total perioperative complications rate [Tables 1-3].

DISCUSSION

Our study used the large NIS administrative database to identify patient characteristics and rates of comorbidities and complications in MS spinal deformity patients undergoing primary lumbar spine fusion compared to a non-MS control group. MS patients undergoing primary lumbar spine fusion were younger, more likely to be female and undergo surgery at urban teaching hospitals and had higher rates of depression and lower rates of diabetes without chronic complications, hypertension and renal failure. Nevertheless, postoperative complication rates and mortality were similar for both groups [Table 4].

Higher rates of depression negatively impact outcomes of lumbar fusion in MS versus non-MS patients undergoing lumbar fusion

Depression was shown to decrease quality of life and impair postoperative rehabilitation in MS patients.^[4,6] In a study of 70,581 patients undergoing lumbar spine surgery, Schoell *et*

Table 3: Comparison of patient complications for MS versus non-MS patients undergoing primary lumbar spine fusion.

Complication	MS, (%)	Control, (%)	P-value
Neurologic	0.59	0.96	P=0.535
Cervical spine-related	0.54	0.54	P=0.992
Pulmonary	2.19	2.56	P=0.729
Cardiac	3.48	2.88	P=0.668
Thromboembolic	0.59	0.78	P=0.729
Renal	2.36	2.39	P=0.983
Infectious	1.25	0.64	P=0.491
Implant-related	5.15	4.97	P=0.917
Incidental durotomy	7.30	4.46	P=0.167
UTI	6.43	3.76	P=0.159
Total complications	29.87	23.94	P=0.169

UTI: Urinary tract infection, MS: Multiple sclerosis

Table 4: Summary of major findings.

	MS, n=842	Control, n=165,726	P-value
Age, y (SD) (range)	60 (9.83) (22-79)	64 (12.55) (18-95)	P<0.001*
Sex (%)			
Female	82.44	67.71	P<0.001*
Male	17.56	32.29	
Location and teaching status (%)			P=0.038*
Rural	1.13	4.28	
Urban non-teaching	35.96	40.9	
Urban teaching	62.92	54.82	
Depression (%)			P=0.003*
Yes	24.6	16.17	
No	75.4	83.83	
Diabetes without chronic complications (%)			P=0.027*
Yes	7.99	13.49	
No	92.01	86.51	
Hypertension (%)			P=0.028*
Yes	49.62	57.54	
No	50.38	42.46	
Renal failure (%)			P=0.033*
Yes	0.52	3.26	
No	99.48	96.74	
Total complications	29.87	23.94	P=0.169
Died during hospitalization (%)			P=0.599
Yes	0	0.19	
No	100	99.81	

*Statistically different rates. MS: Multiple sclerosis, SD: Standard deviation, n: Number, y: Years

al. found that those with depression had a significantly higher risk of neurologic complications, including dural tears, cauda equina syndrome, and failed back surgery syndrome.^[5]

Comparable complication and mortality rates for MS versus non-MS patients undergoing lumbar fusion

Our MS versus non-MS patients undergoing primary lumbar spine fusion had comparable total complication and mortality rates.

CONCLUSION

Our review of the large NIS database revealed that MS patients undergoing primary lumbar spine fusion were younger, more likely to be female and undergo surgery at urban teaching hospitals and had higher rates of depression and lower rates of diabetes without chronic complications, hypertension, and renal failure versus non-MS patients. Interestingly, both groups demonstrated comparable total complication and mortality rates.

Declaration of patient consent

Patients' consent not required as patients' identities were not disclosed or compromised.

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Conflicts of interest

There are no conflicts of interest.

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